Remarks

The Office Action mailed February 11, 2008 has been carefully reviewed and the foregoing amendment has been made in consequence thereof.

Claims 4, 5, 7-12, 16, 17, 19-21, and 25 are now pending in this application. Claims 4, 7-12, 16, 19-21, and 25 stand rejected. Claims 5 and 17 are objected to. Claims 4, 16, and 25 have been amended. No new matter has been added.

The rejection of Claims 4, 7, 8-12, 16, 19, 20, 21, and 25 under 35 U.S.C. § 103(a) as being unpatentable over Mattson et al. (U.S. Patent No. 5,229,934) ("Mattson") in view of Snyder et al. (U.S. Patent 5,923,775) ("Snyder"), Labaere et al. (U.S. Patent 5,717,791) ("Labaere") and Toth et al. (U.S. Patent 6,115,487) ("Toth"), and further in view of Florent et al. (U.S. Patent 5,594,845) ("Florent") is respectfully traversed.

Mattson describes a method for removing streaks from a plurality of images. From time to time, one of thousands of detectors in a scanner array go bad and give an aberration at each sampling (column 1, lines 48-50). When these bad data values are convolved and backprojected with a multiplicity of good data values, the streaks are generated in the images (column 1, lines 50-52). These streaks disrupt the images and often render them useless for diagnostic purposes (column 1, lines 53-54). In performing the method, each pixel is assigned a one or a zero value depending on whether its gradient is above or below a threshold value and loaded into a gradient image memory means (52) (column 4, lines 54-57).

Snyder describes a method for estimating and reducing noise in images. The method estimates and reduces noise in two stages (column 1, lines 60-62). The first is the estimation of the signal dependent noise in the image (column 1, lines 62-63). For each pixel in the image, an estimate of the 2-D gradient is calculated (column 1, lines 65-67). The second is the signal dependent noise reduction through image processing based on the estimates obtained from the first stage (column 1, lines 63-65).

Labaere describes a contrast enhancing processing method of performing a transformation of an original image into a multiresolution edge representation based on a wavelet transform. The multiresolution edge representation is modified and subsequently subjected to a reconstruction procedure.

Toth describes a method for substantially reducing a plurality of artifacts. The artifacts may be introduced in a plurality of computed tomography (CT) images when scanning heads and other dense objects (column 1, lines 46-47). This artifact reduction can also be applied to other artifact correction, such as Z-slope correction (column 6, lines 34-36).

Florent describes a method of reconstruction of a target image, while circumventing the need to use complex geometrical transformations which can only be carried out by means of known commercial products, at great expense and with ancillary technical difficulties which are difficult to surmount (column 2, lines 32-38).

Claim 4 recites a method for facilitating reconstruction of an image, said method comprising "reducing an artifact generated by a change in an anatomy in a z direction, wherein said reducing the artifact is performed by: estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, wherein a value of the estimated gradient is a function of a plurality of values of the reconstructed images; generating a gradient image using the estimated gradient, wherein the gradient image represents a variation of the high density object in z; and generating an error-candidate projection using the gradient image, wherein to generate the error-candidate projection, said method further comprises forward projecting the gradient image along β, wherein β represents a projection view angle."

None of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests a method for facilitating reconstruction of an image as recited in Claim 4. Specifically, none of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests reducing an artifact generated by a change in an anatomy in a z direction, where the reducing the artifact is performed by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images.

Rather, Mattson describes removing streaks from a plurality of images. One of thousands of detectors in a scanner array go bad and give an aberration at each sampling. When these bad data values are convolved and backprojected with a multiplicity of good data values, the streaks are generated in the images. In performing the method, each pixel is assigned a one or a zero value depending on whether its gradient is above or below a threshold value and loaded into a gradient image memory means. Snyder describes a method for estimating and reducing noise in images. For each pixel in the image, an estimate of a two-dimensional (2-D) gradient is calculated. A description of examining, for each pixel in the image, an estimate of a two-dimensional gradient does not describe or suggest reducing an artifact generated by a change in an anatomy in a z direction, where the reducing the artifact is performed by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Labaere describes performing a transformation of an original image into a multiresolution edge representation based on a wavelet transform. Toth describes substantially reducing a plurality of artifacts that may be introduced when scanning heads and other dense objects. This artifact reduction can also be applied to other artifact correction, such as Z-slope correction. A description of applying the artifact reduction to the Z-slope correction does not describe or suggest reducing an artifact generated by a change in an anatomy in a z direction, where the reducing the artifact is performed by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Labaere describes performing a transformation of an original image into a multiresolution edge representation based on a wavelet transform. Florent describes reconstructing a target image, while circumventing the need to use complex geometrical transformations. Accordingly, none of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests reducing an artifact generated by a change in an anatomy in a z direction, where the reducing the artifact is performed by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images.

For at least the reasons set forth above, Claim 4 is submitted to be patentable over Mattson in view of Snyder, Labaere and Toth, and further in view of Florent.

Claims 7-12 depend, directly or indirectly, from independent Claim 4. When the recitations of Claims 7-12 are considered in combination with the recitations of Claim 4, Applicant submits that dependent Claims 7-12 likewise are patentable over Mattson in view of Snyder, Labaere and Toth, and further in view of Florent.

Claim 16 recites a computer programmed to "reduce an artifact generated by a change in an anatomy in a z direction, wherein said computer programmed to reduce the artifact by: estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, wherein a value of the estimated gradient is a function of a plurality of values of the reconstructed images; generating a gradient image using the estimated gradient, wherein the gradient image represents a variation of the high density object in z; generating an error-candidate projection using the gradient image; and forward projecting the gradient image along β, wherein β represents a projection view angle."

None of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests a computer programmed as recited in Claim 16. Specifically, none of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests a computer programmed to reduce an artifact generated by a change in an anatomy in a z direction, where the computer programmed to reduce the artifact by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Rather, Mattson describes removing streaks from a plurality of images. One of thousands of detectors in a scanner array go bad and give an aberration at each sampling. When these bad data values are convolved and backprojected with a multiplicity of good data values, the streaks are generated in the images. In performing the method, each pixel is assigned a one or a zero value depending on whether its gradient is above or below a threshold value and loaded into a gradient image memory means. Snyder describes a method for estimating and reducing noise in images. For each pixel in the image, an estimate of a two-dimensional (2-D) gradient is calculated. A description of examining, for each pixel

in the image, an estimate of a two-dimensional gradient does not describe or suggest reducing an artifact generated by a change in an anatomy in a z direction, where the reducing the artifact is performed by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Labaere describes performing a transformation of an original image into a multiresolution edge representation based on a wavelet transform. Toth describes substantially reducing a plurality of artifacts that may be introduced when scanning heads and other dense objects. This artifact reduction can also be applied to other artifact correction, such as Z-slope correction. A description of applying the artifact reduction to the Z-slope correction does not describe or suggest a computer programmed to reduce an artifact generated by a change in an anatomy in a z direction, where the computer programmed to reduce the artifact by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Florent describes reconstructing a target image, while circumventing the need to use complex geometrical transformations. Accordingly, none of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests a computer programmed to reduce an artifact generated by a change in an anatomy in a z direction, where the computer programmed to reduce the artifact by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. For at least the reasons set forth above, Claim 16 is submitted to be patentable over Mattson in view of Snyder, Labaere and Toth, and further in view of Florent.

Claims 19-21 depend from independent Claim 16. When the recitations of Claims 19-21 are considered in combination with the recitations of Claim 16, Applicant submits that dependent Claims 19-21 likewise are patentable over Mattson in view of Snyder, Labaere and Toth, and further in view of Florent.

Claim 25 recites a computed tomographic (CT) imaging system for reconstructing an image of an object, the imaging system comprising "a detector

array; at least one radiation source; and a computer coupled to said detector array and said radiation source, said computer configured to reduce an artifact generated by a change in an anatomy in a z direction, wherein said computer programmed to reduce the artifact by: estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, wherein a value of the estimated gradient is a function of a plurality of values of the reconstructed images; generating a gradient image using the estimated gradient wherein the gradient image represents a variation of the high density object in z; and generating an error-candidate projection using the gradient image."

None of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests a computed tomographic imaging system for reconstructing an image of an object as recited in Claim 25. Specifically, none of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests a computer configured to reduce an artifact generated by a change in an anatomy in a z direction, where the computer programmed to reduce the artifact by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Rather, Mattson describes removing streaks from a plurality of images. One of thousands of detectors in a scanner array go bad and give an aberration at each sampling. When these bad data values are convolved and backprojected with a multiplicity of good data values, the streaks are generated in the images. In performing the method, each pixel is assigned a one or a zero value depending on whether its gradient is above or below a threshold value and loaded into a gradient image memory means. Snyder describes a method for estimating and reducing noise in images. For each pixel in the image, an estimate of a two-dimensional (2-D) gradient is calculated. A description of examining, for each pixel in the image, an estimate of a two-dimensional gradient does not describe or suggest a computer configured to reduce an artifact generated by a change in an anatomy in a z direction, where the computer programmed to reduce the artifact by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Labaere describes performing a transformation of an original image into a

multiresolution edge representation based on a wavelet transform. Toth describes substantially reducing a plurality of artifacts that may be introduced when scanning heads and other dense objects. This artifact reduction can also be applied to other artifact correction, such as Z-slope correction. A description of applying the artifact reduction to the Z-slope correction does not describe or suggest a computer configured to reduce an artifact generated by a change in an anatomy in a z direction, where the computer programmed to reduce the artifact by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Florent describes reconstructing a target image, while circumventing the need to use complex geometrical transformations. Accordingly, none of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests a computer configured to reduce an artifact generated by a change in an anatomy in a z direction, where the computer programmed to reduce the artifact by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. For at least the reasons set forth above, Claim 25 is submitted to be patentable over Mattson in view of Snyder, Labaere and Toth, and further in view of Florent.

Notwithstanding the above, Applicant respectfully submits that the Section 103 rejection of Claims 4, 7, 8-12, 16, 19, 20, 21, and 25 is not a proper rejection. It appears to the Applicant that the present rejection reflects an impermissible attempt to use the instant claims as a guide or roadmap in formulating the rejection using impermissible hindsight reconstruction of the invention. It is also impermissible to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art. The United States Supreme Court has recently expressed concern regarding distortion caused by hindsight bias in an obvious analysis, and notes that "[a] factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of argument reliant upon ex post reasoning." KSR Int'l Co. v. Teleflex Inc., 127 S. Ct. 1727, 82 USPQ2d at 1397. See also Ex parte Rinkevich, 2007 WL 1552288 (Bd. Pat. App. &

Interf. May 29, 2007). Following the Supreme Court's guidance provided in KSR Int'l Co. v. Teleflex Inc. with respect to impermissible hindsight, a person of ordinary skill in the art having common sense at the time of the invention would not have reasonably looked to Mattson, Snyder, Labaere, Toth, or Florent to solve the problem associated with reducing artifacts in a manner described in the present patent application. Rather, such a suggestion is disclosed only in the present application. For at least this reason alone, Applicant requests that the Section 103 rejection be withdrawn.

Further, the Office Action only offers the conclusory statements that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to have used the techniques of Synder et al. to produce the gradient images, such as those in Labaere et al., used in Mattson et al. to estimate and reduce the noise or artifacts in image slices and thereby improve image quality" and that "it would have been obvious to one of ordinary skill in the art at the time of the invention to use the scaling scheme from Florent et al. in the scaling method of Toth et al. in order to reduce the complexity of the image processing method" to suggest the combination of Mattson, with Snyder, Labaere, Toth, and Florent. Obviousness rejections must be supported with "articulated reasoning with some rational underpinning to support the conclusion of obviousness." See KSR International Co. v. Teleflex, Inc., 127 S. Ct. 1727 at 1740-41, 82 USPQ2d at 1396, citing In re Kahn, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness"). The present rejection does not appear to meet this standard as it reflects no articulated reasoning why the independent or dependent claims are believed to be obvious, but rather is stated in the form of a conclusion of obviousness. Applicant accordingly requests specific explanation and articulation regarding the reasoning and rational underpinning for any obviousness rejection of the claims, or request that the Examiner remove the rejection. It is not believed that adequate reasons why the presently claimed invention is believed to be obvious have been provided on the present record. Of course, such a combination is impermissible, and for this reason alone, Applicant requests that the Section 103 rejection of Claims 4, 7, 8-12, 16, 19, 20, 21, and 25 be withdrawn.

For at least the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 4, 7-12, 16, 19, 20, 21, and 25 be withdrawn.

The rejection of Claims 9 and 19 under 35 U.S.C. § 103(a) as being unpatentable over Mattson in view of Snyder, Labaere, Toth, Florent, and further in view of Moore (U.S. Patent 4,222,104) ("Moore") is respectfully traversed.

Mattson, Snyder, Labaere, Toth, and Florent are described above. Moore describes a computed tomography system and method. The computed tomography system provides data signals for sets of radiation paths. All of the paths of a set are parallel to each other (column 4, lines 10-11). In the computed tomography method, a plurality of modified and interpolated path signals are back projected along a plurality of parallel paths into a matrix of points of an object (column 4, lines 11-13). For a second pass, the modified and interpolated signals are forward projected along parallel paths, corrected and once more back projected along the parallel paths (column 4, lines 13-15).

Claim 9 depends from independent Claim 4, which is recited above.

None of Mattson, Snyder, Labaere, Toth, Florent, and Moore, considered alone or in combination, describes or suggests a method for facilitating reconstruction of an image as recited in Claim 4. Specifically, none of Mattson, Snyder, Labaere, Toth, Florent, and Moore, considered alone or in combination, describes or suggests a method for facilitating reconstruction of an image as recited in Claim 4. Specifically, none of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests reducing an artifact generated by a change in an anatomy in a z direction, where the reducing the artifact is performed by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Rather, Mattson describes removing streaks from a plurality of images. One of thousands of detectors in a scanner array go bad and give an aberration at each sampling. When these bad data values are convolved and backprojected with a multiplicity of good data values, the streaks are generated in the images. In performing the method, each pixel is assigned a one or a zero value depending on whether its gradient is above or below a threshold value and

loaded into a gradient image memory means. Snyder describes a method for estimating and reducing noise in images. For each pixel in the image, an estimate of a two-dimensional (2-D) gradient is calculated. A description of examining, for each pixel in the image, an estimate of a two-dimensional gradient does not describe or suggest reducing an artifact generated by a change in an anatomy in a z direction, where the reducing the artifact is performed by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Labaere describes performing a transformation of an original image into a multiresolution edge representation based on a wavelet transform. Toth describes substantially reducing a plurality of artifacts that may be introduced when scanning heads and other dense objects. This artifact reduction can also be applied to other artifact correction, such as Z-slope correction. A description of applying the artifact reduction to the Z-slope correction does not describe or suggest reducing an artifact generated by a change in an anatomy in a z direction, where the reducing the artifact is performed by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Florent describes reconstructing a target image, while circumventing the need to use complex geometrical transformations. Moore describes backprojecting a plurality of modified and interpolated path signals along a plurality of parallel paths into a matrix of points of an object. For a second pass, the modified and interpolated signals are forward projected along parallel paths, corrected and once more back projected along the parallel paths. Accordingly, none of Mattson, Snyder, Labaere, Toth, Florent, and Moore, considered alone or in combination, describes or suggests reducing an artifact generated by a change in an anatomy in a z direction, where the reducing the artifact is performed by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. For at least the reasons set forth above, Claim 4 is submitted to be patentable over Mattson in view of Snyder, Labaere, Toth, and Florent, and further in view of Moore.

When the recitations of Claim 9 are considered in combination with the recitations of Claim 4, Applicant submits that dependent Claim 9 likewise is

patentable over Mattson in view of Snyder, Labaere, Toth, Florent, and further in view of Moore.

Claim 19 depends indirectly from Claim 16 which is recited above.

None of Mattson, Snyder, Labaere, Toth, Florent, and Moore, considered alone or in combination, describes or suggests a computer programmed as recited in Claim 16. Specifically, none of Mattson, Snyder, Labaere, Toth, Florent, and Moore, considered alone or in combination, describes or suggests a computer programmed as recited in Claim 16. Specifically, none of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests a computer programmed to reduce an artifact generated by a change in an anatomy in a z direction, where the computer programmed to reduce the artifact by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. Rather, Mattson describes removing streaks from a plurality of images. One of thousands of detectors in a scanner array go bad and give an aberration at each sampling. When these bad data values are convolved and backprojected with a multiplicity of good data values, the streaks are generated in the images. In performing the method, each pixel is assigned a one or a zero value depending on whether its gradient is above or below a threshold value and loaded into a gradient image memory means. Snyder describes a method for estimating and reducing noise in images. For each pixel in the image, an estimate of a two-dimensional (2-D) gradient is calculated. A description of examining, for each pixel in the image, an estimate of a two-dimensional gradient does not describe or suggest a computer programmed as recited in Claim 16. Toth describes substantially reducing a plurality of artifacts that may be introduced when scanning heads and other dense objects. This artifact reduction can also be applied to other artifact correction, such as Z-slope correction. A description of applying the artifact reduction to the Z-slope correction does not describe or suggest a computer programmed to reduce an artifact generated by a change in an anatomy in a z direction, where the computer programmed to reduce the artifact by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the

reconstructed images. Labaere describes performing a transformation of an original image into a multiresolution edge representation based on a wavelet transform. Florent describes reconstructing a target image, while circumventing the need to use complex geometrical transformations. Moore describes backprojecting a plurality of modified and interpolated path signals along a plurality of parallel paths into a matrix of points of an object. For a second pass, the modified and interpolated signals are forward projected along parallel paths, corrected and once more back projected along the parallel paths. Accordingly, none of Mattson, Snyder, Labaere, Toth, Florent, and Moore, considered alone or in combination, describes or suggests a computer programmed as recited in Claim 16. Specifically, none of Mattson, Snyder, Labaere, Toth, and Florent, considered alone or in combination, describes or suggests a computer programmed to reduce an artifact generated by a change in an anatomy in a z direction, where the computer programmed to reduce the artifact by estimating a gradient for at least one high-density object using a plurality of reconstructed images separated by a spacing s, where a value of the estimated gradient is a function of a plurality of values of the reconstructed images. For at least the reasons set forth above, Claim 16 is submitted to be patentable over Mattson in view of Snyder, Labaere Toth, and Florent, and further in view of Moore.

When the recitations of Claim 19 are considered in combination with the recitations of Claim 16, Applicant submits that dependent Claim 19 likewise is patentable over Mattson in view of Snyder, Labaere, Toth, Florent, and further in view of Moore.

Claims 5 and 17 are indicated to be allowable if rewritten to include limitations of the base claim and any intervening claims. Applicant thanks the Examiner for the indication of allowable subject matter.

In view of the foregoing amendment and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully submitted,

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